Route

FILE No. 657

*Refer to: Noted by:

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

Project	Date	Author

SUBJECT—

TITLE

FOREST INSECT SURVEY

THE WALKINGSTICK ON THE MENOMINEE INDIAN FOREST

1950

BUREAU OF Entomology and Plant Quarantine
RECEIVED
MAR 1 6 1951
Forest Insect Laboratory
BERKELEY, CALIF.

RECEIVED
JAN 13 1951
U. S. DEPARTMENT OF AGRICULTURE
Forest Insects Laboratory
Ogden, Utah

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Milwaukee 3, Wisconsin

January 5, 1951

INDEX NO.

U. S. GOVERNMENT PRINTING OFFICE 16—47272-1

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FOREST INSECT SURVEY

THE WALKINGSTICK ON THE MENOMINEE INDIAN FOREST - 1950

INTRODUCTION

One of the less conventional forms of insect life associated with certain species of forest trees and shrubs east of the Rocky Mountains is the walkingstick, Diapheromera femorata (Say). An elongate, twig-like insect, aptly described by its common name, the walkingstick is a foliage feeder comparable in voracity to the forest tent caterpillar. At times it has been numerous enough to defoliate its hosts over wide areas, but at endemic population levels which generally prevail, the individual walkingstick is not particularly conspicuous. In many parts of its range it can be regarded only as a curiosity, but in the north central region, especially in the Lake States, its importance as a forest defoliator has been attested to in outbreaks that have occurred with increasing frequency during the last two decades. Aside from its effects on the forest, the walkingstick is a great nuisance to people who enter infested areas. The insect is harmless to man, but is regarded with a good deal of distaste by the average individual.

As a rule, walkingstick outbreaks in the Lake States have been limited to forest types in which red oak species, highly favored as hosts, form a significant component of the stand. Where these outbreaks occur, indications are that certain favored host species succumb under the pressure of severe attacks, especially when the attacks are repeated over a period of several years. Species with less palatable foliage survive. Thus, a change in forest type is one of the products of extensive walking-stick feeding, and the insect has come to be credited with a role of some importance in this regard. Obviously, whether or not type conversion brought about by walkingsticks is desirable, depends entirely upon the extent to which it abets or conflicts with the objectives for which the forest is being managed. Tree-killing insects are usually unquestionably detrimental to forest management aims, but the walkingstick may be either beneficial or injurious, depending upon the nature of stands affected. From studies of infestations in the north central part of the Lower Peninsula of Michigan, Graham (1937) concluded that the preference of the walkingstick for black oaks had resulted in a considerable reduction in their quantity in infested areas, permitting less susceptible but better species, such as white oak, red maple, aspen, and conifers to develop. Similar observations have been made in other parts of the region. On the other hand, walkingstick infestations have also developed in other forest types in which the susceptible species constituted an important component of the ultimate crop. Such is the case on the Menominee Indian Forest.

When walkingsticks become abundant enough to cause serious defoliation, their presence can scarcely pass unnoticed. Their occurrence on the Menominee Indian Forest has been self-evident for some time, but not so apparent has been the cumulative effect of their feeding. During the last two or three years, this matter has been a cause for some concern

to Indian Service foresters, who observed apparently abnormally large numbers of decadent and dying red oaks, and decadent basswood, in sapling and pole size classes in the older infestation centers.

In order to determine the importance of the damage and its relationship to the size of the walkingstick population, the Indian Service in 1949 requested the assistance of the Forest Insect Laboratory, Milwaukee, Wisconsin, in conducting a survey of the infested areas during the 1950 season. A plan for the survey was developed jointly, and Indian Service foresters provided helpful advice in laying out the field work, as well as furnishing various items of survey equipment. The work was financed by the Milwaukee Laboratory. A two-man party, consisting of H. C. Chapman and Martin F. Jones, carried out the field phases of the survey between August 21 and September 8. Subsequently, Chapman assisted in much of the office compilation requisite to the interpretation of survey results. It is the purpose of this report to briefly review the walkingstick problem and summarize the findings of the survey.

WALKINGSTICK HABITS

Some knowledge of the general habits of the insect is fundamental to an understanding of the walkingstick problem, and the ensuing discussion of survey and control work. Information concerning the biology of the insect is presented briefly in the following paragraphs.

Life Cycle

In the Lake States the walkingstick normally has a two year life cycle. In any specific locality the insects are usually numerous only during the even numbered years or only during the odd numbered years. In cases where the even and odd year broods both are present, heavy populations may occur in consecutive years. Studies by Hodson (1949) show that the two year life cycle results from the fact that the egg stage, in which the insects pass the winter, requires a long period for incubation, followed by exposure to low temperatures. The synchronization of the life cycle with climatic conditions is such that these requirements can only be met in nature by the passage of two winters.

The young walkingsticks appear in May and June of the second spring after the season during which the eggs are laid. During the early stages of their development they feed on the foliage of low seedling and sprout growth of host trees, and on such shrubs as witch hazel, sweet fern, etc. As they develop and become larger, they begin to work up into the crowns of the trees. The younger nymphs feed on the smaller trees with crowns well below the general level of the canopy, but the larger nymphs and adults feed up towards the tops of the trees. Adults, which are wingless, do not usually begin to appear until about the first of August, but feeding continues during the adult stage, which persists until the first frost. The females begin to lay eggs 6 to 10 days after reaching maturity, dropping the eggs at random from their feeding positions. The eggs remain in the litter until they hatch.

Preferred Hosts

Walkingsticks show pronounced preferences in their choice of food throughout their period of feeding. Graham (1937) found the young nymphs to be particularly selective. The older nymphs and adults are less discriminating, but some host species are preferred to others. The red oaks are highly favored and, together with basswood and cherry, can be considered the hosts of first choice. Other species that are fed upon to a considerable extent are white birch, hickory, and buttermut. White oak and aspen are attacked but are not as frequently or as heavily defoliated as the foregoing species. Ash and maple, as well as the coniferous species, are seldom touched.

Natural Enemies

Walkingsticks appear to have comparatively few natural enemies. Predation by birds and insects has been observed, but is not important enough to exert any significant effect on the population. A few species of parasites are also known to attack the insects, including one species that attacks the egg stage, but little is known of their habits, or of their individual or collective effect on their host. Considering the ease with which walkingsticks have been able to increase, and their obvious success in developing to outbreak numbers in widely scattered areas in the Lake States, it is doubtful if natural enemies can be depended upon to control the insects.

OCCURRENCE ON THE MENOMINEE INDIAN FOREST 1/

The walkingstick problem on the Menominee Indian Forest is of comparatively recent origin, although the insects have undoubtedly been present in small numbers for many years. Indian Service foresters first observed them to be numerous near the South Branch Church on the east side of the Forest in the summer of 1941. At that time oak saplings were partly defoliated and light defoliation was noted on other hardwood species. Heavy infestations reappeared in 1943 and 1945 at South Branch, and near the Kinepoway Tower in the center of the Forest. In both years, red oak and basswood in pole stands were completely defoliated, but no tree mortality was observed. Following a recurrence of heavy defoliation in these and other areas in 1947, it was observed that mortality of red oak poles and saplings in the infested areas was beginning to occur. In 1949, when the insects were most recently active, Indian Service personnel reconnoitered the Forest and mapped six areas where the walkingstick was numerous and defoliation severe. Thus, it would appear that the walkingstick has a rather brief history as an injurious insect on the Forest; it first appeared in numbers early in the last decade, heavy populations have appeared every other year during odd years; and there has been an apparent increase in the number of decadent and dead trees in stands that have been repeatedly defoliated, in spite of the fact that the defoliation occurred late in the season, and only once every two years. In the fall of 1949 it was evident that from numbers so few as to escape notice 10 years ago, the walkingstick has increased to outbreak proportions over an area estimated to aggregate about 7,000 acres.

1/ From observations made by John W. Libby, formerly Forest Supervisor, Menominee Indian Forest.

SURVEY OF DAMAGE

Objectives

The areas infested in 1949 are shown on the accompanying map (Figure 1). The stands in which the outbreaks have occurred are on good sites, and contain real or potential values of some consequence. For this reason consideration was given early to the desirability of controlling the insect. In order to establish a basis for a decision on action contemplated during the outbreak expected in 1951, a survey of the infested areas was required. The purposes of the survey were to determine (1) if a correlation existed between the degree of apparent tree damage and the abundance of walkingsticks, and (2) the extent of damage in infested stands. In order to accomplish these aims an inventory was made of healthy, decadent, and dead trees, together with measurements of the density of the walkingstick population.

Methods

The survey was accomplished by cruising a series of tenth-acre plots mechanically distributed at uniform intervals approximately 3¼ chains apart within the infested tracts. This approach was adopted after a strip cruise system of sampling was attempted and found to be too time-consuming to complete. The plots were established only within the areas known to be infested with walkingsticks in 1949. Their location in the field was determined by compass and pacing. On each plot the trees were tallied by species and by 1-inch diameter classes beginning with the 3-inch class. Heights were not taken, since the stand and loss estimate can be expressed in terms of basal area per acre. The trees were classified by condition, i. e. healthy, decadent and dead, on the basis of an ocular appraisal of their crowns. Those with a full foliage complement were considered healthy; those with dead or dying tops or branches were classed as decadent; those with no foliage were listed as dead. The decadent and dead trees were bark blazed to indicate that they had been tallied in the present cruise.

The survey system employed in this work was designed to sample 0.1 percent of the total stand infested, irrespective of condition class. It was calculated that the method of sampling would yield stand and loss estimates statistically accurate to ± 15 percent of the actual values for the total area involved. As actually carried out, the intensity of sampling was slightly less than 0.1 percent.

At the time of the survey the walkingsticks were in the egg stage in the litter. The sorting and counting of these eggs under field conditions is impractical, where any large number of samples are required; hence it was necessary to collect litter samples in the field and place them in separate containers for later sorting. In this survey a one-square foot litter sample was collected on each plot. In each case the sample was taken beneath a tree species, usually red oak, on which the walkingstick is known to feed, and the litter was removed to the mineral soil. This material was placed in a paper bag, appropriately marked as to location, etc. Subsequently, most of the extraneous material was

separated from the eggs with a power-driven shaker equipped with a series of screens, 2/ and from the remaining fraction the eggs were sorted by hand and counted.

RESULTS

A total of 52 plots embracing an area of 5.2 acres and sampling a total infestation area of 6,346 acres, were cruised in the survey. Their location and distribution is shown in Figure 1. An analysis of the stand data from these plots reveals that the forest is characterized by a predominance of hardwood species, interspersed with small numbers of conifers, all chiefly in the smaller diameter classes. Twelve different hardwoods (including more than the same number of tree species) and 5 conifers were recorded. The average number of trees per acre, of 3 inches DBH and larger, irrespective of condition class, was 633.2. Of this number 92.4 percent were hardwoods, and 7.6 percent were conifers. The average basal area per acre was 88.0 square feet, of which 84.1 percent were hardwoods and 15.9 percent conifers. Among the hardwood species present, aspen was most abundant, followed by red oak and basswood. These three species comprised slightly more than 67 percent of both the total number of trees and the total basal area. The balance of the stand, exclusive of the coniferous species, was made up of minor hardwoods. Of the three most common hardwoods present, two (the red oak and basswood) are highly favored foods of the walkingstick, and the third (aspen) is fed upon to some extent.

The stand and loss data obtained in the survey are presented in Tables 1 and 2. Aspen, red oak, basswood, cherry and birch were the principal susceptible tree species present in significant numbers. Summaries of the plot records for these five hardwoods are shown individually, while records for other species, excepting conifers, and combined under "other hardwoods". Table 1 shows the average number of trees 3 inches DBH and larger, and average basal area in square feet per acre by species for each condition class. Also shown is the percent of the total stand in each condition class. In Table 2 the percent healthy, decadent, and dead computed from the basal area data for each condition class, are listed by tree species.

2/ Equipment of the Department of Entomology and Economic Zoology, University of Minnesota, made available for this work.

Figure 1.

FOREST INSECT SURVEY

NORTHERN WALKINGSTICK INFESTATION ON THE MENOMINEE INDIAN RESERVATION

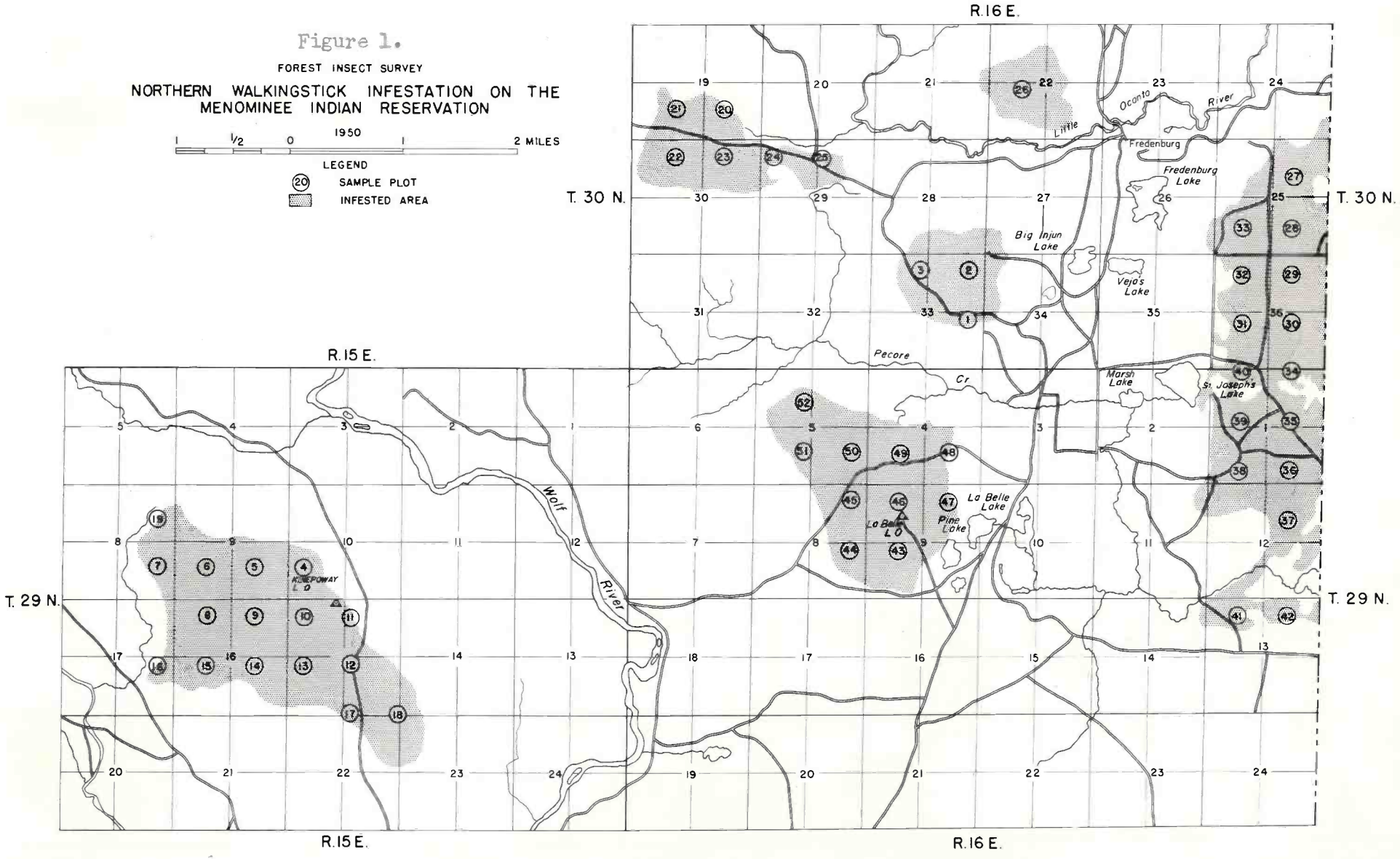
1950

1 1/2 0 1 2 MILES

LEGEND

(20) SAMPLE PLOT

INFESTED AREA



BE&PQ NOV 1950

TABLE 1. Number of Trees* and Basal Area** per Acre, by Species and Condition Classes in Walkingstick-Infested Stands on Menominee Indian Forest. 1950.

Tree Species	Healthy		Decadent		Dead		Total		Percent of Total	
	No. Trees	B. A.	No. Trees	B. A.	No. Trees	B. A.	No. Trees	B. A.	No. Trees	B. A.
Aspen	218.3	31.67	22.3	3.48	26.3	2.74	266.9	37.89	42.2	43.2
Red Oak	32.1	6.87	23.3	4.85	52.9	5.23	108.3	16.95	17.1	19.3
Basswood	40.2	3.39	7.7	.64	1.9	.14	49.8	4.17	7.9	4.7
Cherry	5.8	.70	9.8	.91	8.3	.61	23.9	2.22	3.8	2.5
Birch	10.2	1.31	0.6	.05	6.0	.51	16.8	1.87	2.6	2.1
Other Hdwds	113.6	9.83	2.1	.22	3.5	.80	119.2	10.85	18.8	12.3
Conifers	47.3	13.85	0.4	.04	0.6	.12	48.3	14.01	7.6	15.9
All Species	467.5	67.62	66.2	10.19	99.5	10.15	633.2	87.96	100.0	100.0
Percent of Total Stand	73.9	76.9	10.4	11.6	15.7	11.5	100.0	100.00		

* 3 inches DBH and larger

** Square feet

TABLE 2. Percent of Basal Area Healthy, Decadent and Dead, by Tree Species, in Walkingstick-Infested Stands on Menominee Indian Forest - 1950.

Tree Species	B. A. / Acre (sq. ft.)	Healthy (percent)	Decadent (percent)	Dead (percent)
Aspen	37.89	83.6	9.2	7.2
Red Oak	16.95	40.5	28.6	30.9
Basswood	4.17	81.4	15.2	3.4
Cherry	2.22	31.3	41.3	27.4
Birch	1.87	70.3	2.4	27.3
Other Hardwoods	10.85	90.6	2.1	7.3
Conifers	14.01	98.9	0.3	0.8

An analysis of the records summarized in these tables shows that for the stand as a whole, 20.3 square feet or about 23 percent of the total basal area per acre are decadent or dead. The damage is about equally divided between the two condition classes. For the conifers and the non-susceptible hardwoods, decadence and mortality total less than 1.2 square feet or 1.3 percent of the total basal area per acre. The remaining 19.1 square feet is made up of species that are preferred hosts of the walkingstick. Expressed is a percentage of the basal area of each species present, the losses are distributed in the following order: cherry, 68.7; red oak, 59.5; birch, 29.7; basswood, 18.6; aspen, 16.4 percent. This sequence is probably fairly indicative of the order of preference by the insect. These percentages, however, do not take into account the abundance and availability of the host as do the actual figures in square feet of basal area per acre damaged; viz., red oak 10.1, aspen 6.2, cherry 1.5, basswood 0.8, and birch 0.6 square feet. With this information alone, neither the percent of the basal area damaged nor the actual loss figures in square feet per acre can be attributed entirely to the walkingstick, since it is known that competition, disease, and other insects influence survival. However, in passing, it is worthy of note that host species highly favored by the insect have been damaged severely, and that decadence and mortality among the susceptible species far exceeds that of nonsusceptible species or conifers, irrespective of how they are expressed.

One other feature of interest concerning the injury is its distribution by diameter classes. This is depicted by the data presented in Table 3. It will be seen from a study of the diameter distribution of healthy and decadent or dead trees, that for the species preferred by walkingsticks, such as cherry, red oak, basswood and birch, a preponderance of the damage occurs in diameter classes below 8 inches. For aspen the damage is fairly uniformly distributed for the lower diameter classes, but begins to increase for diameter classes above 8 inches. Obviously, some losses are to be expected in the lower diameter classes for reasons mentioned above. Here again, however, it seems significant that the heaviest damage occurs among species most highly favored by the insect.

Considering the preponderance of losses among the preferred hosts and within the smaller diameter classes, it is to be expected that a relationship would be found to exist between walkingstick abundance and severity of damage. A summary of the data on the number of eggs per square foot litter sample, and decadence and mortality on the corresponding plots is given in Table 4. In this survey the damage was found to be most severe on plots having the greatest number of eggs, and least on those having the smallest number of eggs. Statistical analyses show that the relationship is linear rather than curvilinear, and that it is expressed by the regression line depicted in Figure 2; the standard error of the estimate is 7.46 square feet; the correlation coefficient 0.832, is highly significant. The interpretation placed on these data is that for the susceptible tree species, losses of approximately 11 square feet in basal area per acre are due to causes other than walkingstick defoliation, while losses above that amount are proportional to the density of the walkingstick population. Statistical treatment similar to that referred to above was given to the data for red oak alone, since the species is one of the most highly favored hosts, and was second only to aspen in abundance. A similar relationship between walkingstick abundance and losses was found; the trend as shown by the regression line (Figure 3) is practically identical to that for all susceptible species. In both of these analyses the standard error of the estimate is comparatively large, slightly more than half of the error in the first instance and nearly two thirds in the second being dissociated from egg abundance. Presumably this is due to the comparatively small number of litter samples taken.

TABLE 3. Number of Trees per Acre and Percent Healthy, Decadent, and Dead by Species and Diameter Classes, in Walkingstick-Infested Stands on Menominee Indian Forest - 1950

Tree Species	Percent of Total Stand	DBH Class (inches)	No. Trees per Acre	Healthy (percent)	Decadent (percent)	Dead (percent)
Aspen	42.2	3 - 4	147.1	77.8	9.3	12.9
		5 - 6	83.5	88.0	5.1	6.9
		7 - 8	19.8	87.3	7.8	4.9
		9 -10	13.8	80.5	16.7	2.8
		11-	2.7	71.5	21.4	7.1
		All	266.9	81.7	8.4	9.9
Red Oak	17.1	3 - 4	65.7	23.2	20.2	56.6
		5 - 6	26.3	28.4	19.0	52.6
		7 - 8	9.6	54.0	34.0	12.0
		9 -10	4.4	69.6	21.7	8.7
		11-	2.3	50.0	33.3	16.7
		All	108.3	23.8	23.3	52.9
Basswood	7.9	3 - 4	41.3	81.9	14.4	3.7
		5 - 6	7.3	71.0	23.7	5.3
		7 - 8	0.8	100	0	0
		9 -10	0.4	100	0	0
		11-	0	100	0	0
		All	49.8	80.7	15.4	3.9
Cherry	3.8	3 - 4	17.1	15.8	44.9	39.3
		5 - 6	5.8	43.3	30.0	26.7
		7 - 8	0.6	67.0	33.0	0
		9 -10	0.4	50.0	50.0	0
		11-	0	100	0	0
		All	23.9	24.2	41.1	34.7
Birch	2.6	3 - 4	10.2	52.8	3.8	43.4
		5 - 6	5.4	67.8	3.6	28.6
		7 - 8	0.8	100	0	0
		9 -10	0.4	100	0	0
		11-	0	100	0	0
		All	16.8	61.0	3.4	35.6
Other Hardwoods	18.8	All	119.2	95.3	1.8	2.9
Conifers	7.6	All	48.3	98.0	0.8	1.2
All Species	100.0	All	633.2	73.8	10.5	15.7

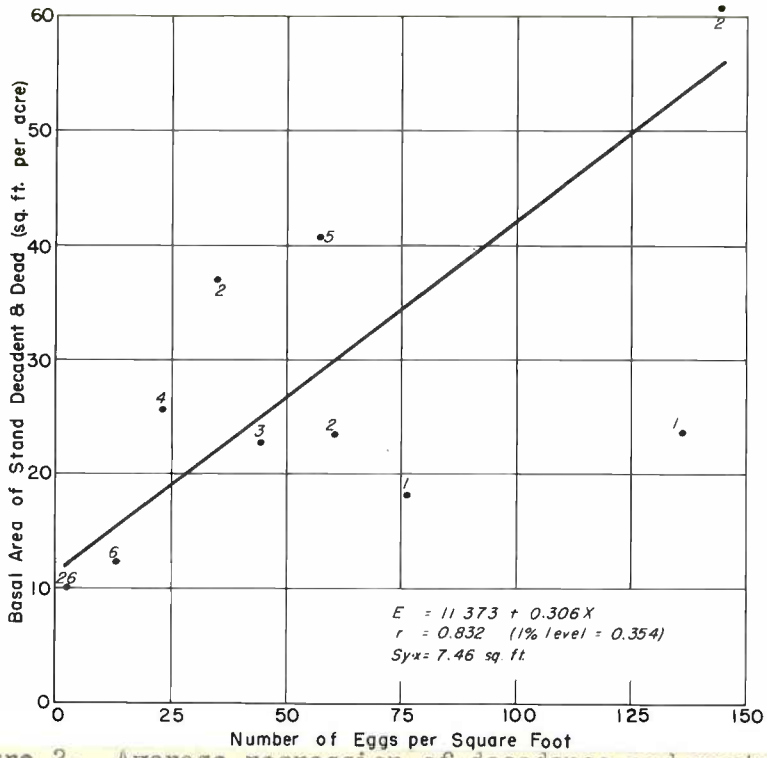

Basal Area of Stand Decadent & Dead (sq. ft. per acre)
Number of Eggs per Square Foot
E = 11.373 + 0.306 X
r = 0.832 (1% level = 0.354)
Sy·x = 7.46 sq. ft.

Figure 2. Average regression of decadence and mortality of susceptible tree species on walkingstick egg populations in infested stands.

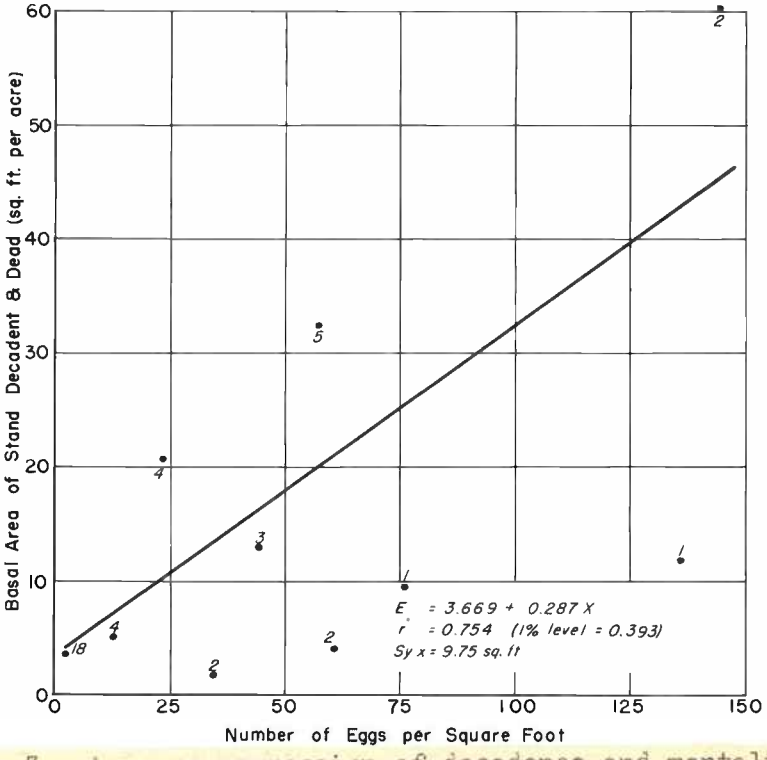


Figure 3. Average regression of decadence and mortality of red oak on walkingstick egg populations in infested stands.

TABLE 4. Decadence and Mortality of Susceptible Tree Species, and Number of Walkingstick Eggs per Square Foot in Infested Stands on Menominee Indian Forest - 1950.

No. Eggs per Sq. Ft. Class	Average	Basal Area per Acre Decadent and Dead (square feet)	Number Samples
0 - 9	2.1	10.16	26
10 - 19	12.7	12.47	6
20 - 29	23.0	25.61	4
30 - 39	34.5	37.09	2
40 - 49	44.0	22.93	3
50 - 59	57.0	40.75	5
60 - 69	60.5	23.59	2
70 - 79	76.0	18.23	1
130 - 139	136.0	23.73	1
140 - 149	144.5	60.64	2

DISCUSSION AND CONCLUSIONS

As stated previously, the basal area, including all trees 3 inches in DBH and larger, irrespective of condition, is approximately 80 square feet per acre in the infested stands. This may be considered to represent medium stocking for stands of this kind. If the 20.3 square feet of basal area classified as decadent and dead were considered a total loss (which it is not, since the decadent trees are still living) the remaining stand is presumably sufficient for cover and for restocking. The survey, however, shows that the losses are to some extent dependent upon walkingstick abundance, thus it can hardly be expected that they will remain static, or even continue at the same rate. It is more likely that continued feeding will cause trees at present uninjured to show signs of decadence, and for those now decadent to succumb. Moreover, it is quite possible that the injury will proceed at an accelerated rate, if one can consider that the damage that has taken place probably has occurred mostly during the last 10 years, concurrent with the rise in the walkingstick population. Barring some unforeseen development having a catastrophic effect on the walkingstick population, there is little basis for believing that natural factors will curtail the outbreak. It seems inevitable that the preferred hosts, red oak and basswood in particular, will continue to suffer severe injury if the feeding is not checked. It would appear that the loss of these species, which would otherwise ultimately form a valued component of the final timber crop, may be of some consequence. If the current trend continues, it will tend to result in the replacement of desirable hardwood species with those less desirable.

The walkingstick, being a leaf-feeding insect, is susceptible to control by insecticides that are effective against other forest defoliators. Recent studies have shown that an oil solution of DDT, applied by airplane at a rate of 1 pound in 1 gallon of insecticide per acre, is sufficient

to reduce the populations markedly in infested stands. The effectiveness of this spray against the walkingstick was demonstrated by A. C. Hodson, University of Minnesota, in tests conducted in 1949. Hodson's success with this insecticide was confirmed in 1950 by the results of a small scale control operation against the walkingstick on a 200-acre tract on the Nicolet National Forest. The latter experiment was conducted jointly by the Milwaukee Forest Insect Laboratory and the United States Forest Service. The studies have shown that the insect is highly vulnerable to aerial sprays applied when the greater portion of the population is in the late nymphal stages. Development has usually progressed to the late nymphal stages by early August. By this time the walkingsticks will be found feeding toward the upper parts of the tree, and consuming considerable quantities of foliage. Perhaps the most important advantage of controlling the insects in the nymphal stage, is that such timely action will forestall continuance of the infestation, as the walkingsticks will not have had a chance to lay their eggs prior to their death. It is believed that by proper timing, one application of sprays can be effectively used to curtail defoliation and prevent the recurrence of the walkingstick in outbreak numbers for at least several years, although the latter is yet to be demonstrated.

Because walkingsticks are not winged, and because of the fact that they appear in numbers at two-year intervals, their rate of spread is comparatively slow where food is fairly plentiful. This knowledge is of some value, for it means that the control work, if properly planned, can be undertaken on a unit basis over a period of time without the usual danger that the treated area will be overrun by the population remaining on the untreated area before the entire infestation is controlled. This suggests a practical approach to the problem of combatting the walkingstick on the Menominee Indian Forest, if the values jeopardized or lost are of sufficient importance to warrant action. The approach referred to is to plan the control program, and execute it over a period of perhaps several years. It seems likely that the financial and physical obstacles to control work would be minimized by extending the work over a period of time rather than attempting to complete it entirely in one year. Furthermore, adjustments that may prove advisable in the light of further experience and knowledge could be made as needed if this approach were taken.

To properly plan for control of the insect over an extended period of time the establishment of priorities for treatment for the different infestation areas is advisable. There are undoubtedly points to be considered other than the quantity of susceptible species present, the degree of damage, and the abundance of the walkingsticks on each infested area; for example, proximity of the infestation to more valuable stands, use, etc. However, if these factors alone are to be taken into account, the priority for treatment can be computed by obtaining for each area the product of the formula:

$$\text{No. eggs / sq. ft.} \times \frac{\text{B. A. decadent and dead}}{\text{B. A. susceptible species}} \times \frac{\text{B. A. susceptible species}}{\text{B. A. all species}}$$

The order for treatment is the same as the order of the numerical values of the products, the largest value being first. On this basis the priority for treatment of each infestation center is as follows:

Computed Product	Priority	Infestation Center
10.3	1	La Belle Tower
8.7	2	Kinepoway Tower
5.2	3	S. 19, 20, 30, T 30 N., R 16 E
4.9	4	S. 33, T 30 N, R 16 E
2.1	5	East Boundary
0.9	6	S. 22, T 30 N, R 16 E

Data on acreage, stand and loss characteristics, and density of the walkingstick population for each of these areas is given in Table 5.

TABLE 5. Degree of Infestation (Eggs per Square Foot) and Density of Stocking (Basal Area per Acre) in Walkingstick Infestation Centers on Menominee Indian Forest - 1950.

Infestation Center	Area (Acres)	No. Sample Plots	No. Eggs per Sq. Ft.	Basal Area per Acre (sq. ft.) All Species *	Susceptible Species *	Decadent & Dead Susc. Spec.
La Belle Tower	1173	10	38.6	86.04	67.14	22.88
Kinepoway Tower	1798	16	29.0	72.75	69.74	21.81
Sec. 19, 20, 30, T 30 N, R 16 E	593	6	27.7	112.96	95.70	21.25
Sec. 33, T 30 N, R 16 E	421	3	12.3	79.13	50.07	31.47
East Boundary	2102	16	16.8	96.00	45.12	11.82
Sec. 22, T 30 N, R 16 E	259	1	9.0	98.22	70.13	9.73

* Includes living, decadent and dead 3 inches DBH and larger.

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